IN THE CLAIMS

Please amend the claims as follows:

1. **(Currently Amended)** A method for estimating **an** **[the]** error statistic for retrieved temperature and emissivity of a surface material, comprising:

determining **a second order** ~~**the second order**~~ analytical error propagation for **a** surface temperature and **a surface** emissivity of a surface material;

retrieving **the** surface temperature and **the surface** emissivity from a sufficiently large ensemble of radiance spectra by Monte Carlo simulation; and

determining **an** **[the]** error **statistic** in **the** retrieved surface temperature and **the retrieved surface** emissivity arising from random instrument noise**, the error statistic being based at least in part on the second order** **[from]** analytical error propagation and/or **the** Monte Carlo simulation.

2. **(Original)** The method for estimating the error statistic as in Claim 1, wherein determining the second order analytical error propagation comprises determining the covariance and bias surface temperature and emissivity errors retrieved utilizing an ISSTES algorithm.

3. **(Currently Amended)** The method for estimating the error statistic as in Claim 1, wherein retrieving **the** surface temperature and **the surface** emissivity by Monte Carlo simulation comprises generating an unbiased ensemble of measurement errors for **a** **[the]** covariance of **[the]** measured variables.

4. **(Currently Amended)** The method for estimating the error statistic as in Claim 3, wherein retrieving **the** surface temperature by Monte Carlo simulation comprises adding errors to produce an ensemble simulating the results of making the same measurement many times.

5. **(Currently Amended)** The method for estimating the error statistic as in Claim 4, wherein retrieving **the** surface temperature by Monte Carlo simulation further comprises evaluating an ensemble of measurement utilizing the function F(X) to generate an ensemble of dependent variables.

6. **(Currently Amended)** The method for estimating the error statistic as in Claim 5, wherein retrieving surface **the** temperature by Monte Carlo simulation further comprises estimating the mean, bias and variance of dependent variables.

7. **(Currently Amended)** The method for estimating the error statistic as in Claim 6, wherein retrieving **the** surface temperature by Monte Carlo simulation further comprises retrieving surface temperature and emissivity for each spectrum in an ensemble.

8. **(Original)** The method for estimating the error statistic as in Claim 1, wherein determining the second-order analytical error propagation comprises translating a radiance error of a surface material into a diagonal covariance matrix.

9. **(New)** The method of Claim 1, further comprising, applying the error statistic to the retrieved surface temperature and the retrieved surface emissivity to determine a corrected surface temperature and a corrected surface emissivity.

10. **(New)** An optical sensing system, comprising:

an instrument operable to retrieve a surface temperature and a surface emissivity from an ensemble of radiance; and

a processing device operable to estimate an error statistic in the received surface temperature and the received surface emissivity arising from random instrument noise, the estimated error statistic being based at least in part on a second-order analytical propagation or a Monte Carlo simulation.

11. **(New)** The optical sensing system of Claim 10, wherein the instrument operates to receive the ensemble of radiance, the ensemble of radiance representing the surface temperature and the surface emissivity of a terrestrial surface.

12. **(New)** The optical sensing system of Claim 10, wherein the instrument comprises a spectrometer.

13. **(New)** The optical sensing system of Claim 10, wherein the instrument comprises an ISSTES algorithm capable of retrieving the surface temperature and the surface emissivity from the ensemble of radiance.

14. **(New)** The optical sensing system of Claim 13, wherein the random instrument noise is no more than one (1) $\mu W/cm^2$-sr-μm and wherein the ISSTES algorithm provides unbiased surface temperature and unbiased surface emissivity retrievals.

15. **(New)** The optical sensing system of Claim 10, wherein the ensemble of radiance comprises airborne hyperspectral thermal infrared data associated with a terrestrial surface.

16. **(New)** The optical sensing system of Claim 10, wherein the processing device operates to determine a corrected surface temperature and a corrected surface emissivity by

applying the error statistic to the retrieved surface temperature and the received surface emissivity.

17. **(New)** The optical sensing system of Claim 10, wherein the random instrument noise is no more than five (5) $\mu W/cm^2$-sr-μm.

18. **(New)** The optical sensing system of Claim 10, wherein the second-order analytical propagation estimates a bias of the received surface temperature and the received surface emissivity.

19. **(New)** The optical sensing system of Claim 10, wherein the estimated error statistic is based at least in part on a first-order analytical propagation, the first-order analytical propagation capable of estimating a standard deviation of the received surface temperature and the received surface emissivity.

20. **(New)** A system for estimating the error statistic of a surface material, comprising:

means for retrieving a surface temperature and a surface emissivity from a sufficiently large ensemble of radiance; and

means for estimating an error statistic in the received surface temperature and the received surface emissivity arising from random instrument noise, the estimated error statistic being based at least in part on a second-order analytical propagation or a Monte Carlo simulation.

21. **(New)** A system for estimating an error statistic of a surface material, comprising:

a computer system having a processor;

a computer readable medium coupled to the computer system, the computer readable medium comprising a program operable, when executed on the processor, to:

retrieve a surface temperature and a surface emissivity from a sufficiently large ensemble of radiance; and

estimate an error statistic in the received surface temperature and the received surface emissivity arising from random instrument noise, the estimated error statistic being based at least in part on a second-order analytical propagation or a Monte Carlo simulation.